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REVISED Technical Memorandum For The Conversion Technologies Market Impact Assessment

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Submitted to

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1.0 STUDY DEFINITION

1.1 Overall Purpose

Assembly Bill 2770 (Chapter 740, Statutes of 2002) requires the California Integrated Waste Management Board (CIWMB) to prepare a report on new and emerging technologies (such as gasification, acid hydrolysis, distillation, catalytic cracking) to convert organic wastes to usable energy and products, collectively referred to as "conversion technologies." A significant amount of discussion has taken place through CIWMB-sponsored forums, within the CIWMB and within the legislature regarding conversion technologies and their potential impacts on statewide recycling markets. In recognition of the concerns that were raised, AB 2770 included the requirement that the CIWMB's report on conversion technologies (CT) include "A description and evaluation of the impacts on the recycling and composting markets as a result of each conversion technology."

1.2 Specific Objectives

The study seeks to estimate the impacts that conversion technologies might have on existing and future recycling and composting markets. The CIWMB has prepared a list of questions that the Market Impact Assessment seeks to answer; the complete list of questions is in section 6.

In general, the study seeks to answer questions in two categories: 1) economic and financial impacts, and 2) institutional impacts on recycling and composting markets. More specifically, the Market Impact Assessment will consist of tasks to quantitatively analyze whether the development of conversion technologies in California will have negative, neutral, or positive impacts on the paper, plastic and organic materials management industries' ability to remain viable and/or expand. Development of conversion technologies may also have possible current and future economic and financial impacts on these industries, including changes in: feedstock composition, price, employment, output, business elimination and creation, competitiveness, revenue, and profit.

1.2.1 Economic and Financial Impact Objectives

Estimate impacts on recycling and composting industries due to potential increases or decreases in feedstock supply (in tons) from new conversion technology facilities. If there is a <u>tonnage</u> impact, estimate effect, in terms of revenue gain or loss, production and employment levels, both to the industries as a whole, and to individual firms. If there is a <u>price</u> impact, what effects will increased or decreased prices have, in terms of total revenues (dollars), both to the industries as a whole, and to individual firms.

Estimate which technology configurations will have greatest/least impact on recycling and composting.

1.22 Institutional Impact Objectives

Research and provide analysis regarding:

- Impacts on hauler contractual relationships
- Municipal contractual relationships
- Effects on regional recycling and composting infrastructure and siting of new facilities
- Effects of Conversion Technology put-or-pay contracts on recycling and composting businesses

2.0 GENERAL APPROACH

We begin with the assumption that a finite quantity of materials are generated in a given time period, and that a portion of that finite quantity is disposed, while the remainder is diverted from disposal, through recycling and composting. If conversion technology facilities are built and utilized, then the increase (from zero) of materials to CT facilities must necessarily cause a decrease in materials to landfills (as ADC or waste) or decreases to other recycling or composting facilities. (MRFs and transfer stations may see an increase in throughput and produce more recycled product.) The question then becomes: which facilities will lose materials as a result of CT facilities – recycling facilities, composting facilities, or landfills?

Our general approach is to collect data regarding the current marketplace, including quantities and compositions of various waste and recycling streams, the entities that make decisions regarding disposition of these materials (generators, jurisdictions, MRF operators , and haulers), the reasons for those decisions (AB 939 regulatory mandates, political mandates, costs and transportation distances), and quality and quantity needs of paper and plastic recycling processors and exporters and the composting industry. We will model the relationships of material movement through the system, including prices paid at various points. Then we will overlay the conversion technology system configurations, quality, composition and price of material needs (demand) in order to estimate what might occur if such facilities were developed. We will also conduct a sensitivity analysis by changing key model assumptions to see their affect on the model outputs. All data will be projected year-by-year for an 8-year period (2003 to 2010).

Our general methods include researching existing reports and articles, and examining them for useable data, contacting industry associations for published reports and forecasts, collecting data from CIWMB in-house databases, compiling data from in-house databases, files and reports, and conducting surveys and interviews to collect primary data and "industry expert" forecasts and opinions. Focus group and peer review participants will likely also provide useful quantitative and qualitative information.

In general, our work will be organized into the following steps:

- Develop CT configuration assumptions and other key modeling assumptions;

- Develop baseline projections for recycling and composting, including the lower, most likely and upper bound estimates; and,
- Estimate impacts of CT on recycling and composting.

A financial model will be developed to input and summarize data and to perform certain calculations. In addition, much of the data gathered will be qualitative. The analysis portion of the project will include a review of the results of the overall model in the context of the qualitative data in order to establish findings and reach conclusions. Results will be presented in a report format, which will also include a "typical firm" analysis for firms in the recycling and composting industries, as described in section 6.1.3.

A brief summary of the overall financial model is listed here; more detailed descriptions of the modules appear in section 5.

Schematic diagrams of the financial model appear in figures 1 through 3, on pages 29, 30 and 31.

2.1 Brief Summary of Financial Model

Module 1: Scenario Definitions and General Assumptions

- Establishes relationships between items to be modeled
- Placeholder for key model assumptions

Module 2: Waste Disposal Quantity

- Establishes waste disposal baseline in each of two regions
- Estimates waste disposal projections, through 2010, before the effects of conversion technologies

Module 3: Waste Diversion Quantity

- Establishes waste diversion baseline in each of two regions
- Estimates waste diversion projections, through 2010, before the effects of conversion technologies (due to natural growth of materials, not program changes)

Module 4: Jurisdiction Diversion Gap

- Modifies the waste diversion baseline and projections by quantifying the growth of diversion that will occur when jurisdictions implement new diversion programs to meet the requirements of AB 939

Module 5: Disposal Costs

- Estimates costs of disposal in the two regions so that costs can later be compared to CT facilities

Module 6: Diversion Revenues and Prices

- Historic market prices for materials under study, as well as estimates of future prices (ranges) would be summarized in this module for each of the two regions

Module 7: Current State of Recycling Businesses

- This module would essentially be a database of recycling businesses in the two regions, and would include name of business (which would be kept confidential), type of business, material/s handled, annual throughput, number of employees, and annual revenues. Aggregate data in this module will help us develop factors such as number of jobs per thousand tons handled for each material type in each region.

Module 8: Conversion Technology Costs and Feedstock Requirements

- This module will summarize feedstock requirements (material type and quality) for the various CT facility types, and will also summarize tipping fees for each facility type in each region

Module 9: Summary and Integration Module

- Jurisdictions and haulers generally make choices about where to send materials based on AB 939 diversion requirements first and least-cost alternatives second. Once we have comparative prices and feedstock requirements (material types and quantities) for all of the various facility types, and diversion rate information for all of the jurisdictions in the two regions, the model can simulate the choices that jurisdictions and haulers will make about which facilities to send materials to.

2.2 Facility Configurations

2.2.1 Initial Facility Configuration (2003)

Facility configurations that were developed in the Request for Proposals will be used for modeling purposes. However, during the course of our work, the project team may find that this initial configuration is unlikely due to either the lack of technology advances or unavailability of suitable feedstock. Facility configurations may be changed by the project team as appropriate. The total throughputs are summarized in the two tables at the end of this section.

Initially, the following facilities will be included in the model for each of two regions—the San Francisco Bay Area and the Greater Los Angeles Area (see sections 3.2 and 3.3 for more detail about the two regions):

- Two to three acid hydrolysis facilities with total combined capacity of 1,500 tons per day;
- Three to four gasification facilities with total combined capacity of 2,000 tons per day;
- One catalytic cracking facility with a capacity of 50 tons per day.

The total CT capacity for 2003 will be 3,550 tons per day, in each region. Note that because transportation costs are not being modeled (see section 3.2 for an explanation), and because total conversion technology facility capacity is fixed at these assumed tonnage levels, the specific number of facilities (e.g. “2 or 3” acid hydrolysis facilities, or “3 or 4” gasification facilities) will not affect the study results.

2.2.2 Future Facility Configurations (2005, 2007, 2010)

In 2005, an additional gasification facility will be added in each region with a capacity of 500 tons per day, for a combined total capacity of 4,050 tons per day in each region.

In 2007, two additional acid hydrolysis facilities will be added in each region with a combined capacity of 1,000 tons per day, for a total combined capacity of 5,050 tons per day in each region.

In 2010, one additional gasification facility will be added in each region with a capacity of 500 tons per day, for a total combined capacity of 5,550 tons per day in each region.

FACILITY CONFIGURATIONS, 2003 TO 2010, TONS PER DAY

	2003	2004	2005	2006	2007	2008	2009	2010
Acid Hydrolysis	1,500	1,500	1,500	1,500	2,500	2,500	2,500	2,500
Gasification	2,000	2,000	2,500	2,500	2,500	2,500	2,500	3,000
Catalytic Cracking	50	50	50	50	50	50	50	50
TOTAL	3,550	3,550	4,050	4,050	5,050	5,050	5,050	5,550

FACILITY CONFIGURATIONS, 2003 TO 2010, TONS PER YEAR
(based on 312 operating days per year)

	2003	2004	2005	2006	2007	2008	2009	2010
Acid Hydrolysis	468,000	468,000	468,000	468,000	780,000	780,000	780,000	780,000
Gasification	624,000	624,000	780,000	780,000	780,000	780,000	780,000	936,000
Catalytic Cracking	15,600	15,600	15,600	15,600	15,600	15,600	15,600	15,600
TOTAL	1,107,600	1,107,600	1,263,600	1,263,600	1,575,600	1,575,600	1,575,600	1,731,600

2.3 Market Conditions

It is possible that certain regulatory provisions or economic incentives such as preferential tax treatment could be devised and implemented to protect either existing supplies of recyclables and green waste feedstock or future supplies. Our modeling efforts will simulate these provisions, under the following three scenarios:

- Condition #1: No provisions to protect feedstock – all materials go to facilities with the lowest tipping fees or highest prices paid for feedstocks

- Condition #2: Provisions to protect existing feedstock – the model will only consider price as a decision point *after* quantities equivalent to existing quantities are recycled within the existing infrastructure

- Condition #3: Provisions to protect existing and future feedstock – the model will only consider price as a decision point *after* quantities equivalent to existing *and* future projected recyclables quantities are recycled

While we do not know what exact form these protective provisions might take, the specific mechanisms that may be used are not necessary for modeling purposes. We will, however, identify the types of regulatory and economic provisions that may be available. In the model we will make the broad assumption that, if protective provisions are in place, CT facility feedstock must come from either mixed solid waste that is currently landfilled, or MRF residuals. With protective provisions, sufficient feedstock supply will be available for:

- all current recyclables and green waste demand that would otherwise be projected by the model, for condition #2.

- all current *and future* recyclables and green waste demand that would otherwise be projected by the model, for condition #3.

3.0 HOW WE WILL DEVELOP KEY MODEL ASSUMPTIONS

3.1 Growth Scenarios

Our goal is to develop upper bound, most likely and lower bound growth scenarios for generation of materials that would be feedstock for the recycling and composting industries. Several reasonable options to project future quantities of materials are listed below; note that each method has its advantages and disadvantages. This section describes methods to project growth; the underlying diversion quantities are described in section 5.3.

<u>Method 1. Population Growth as a Growth Factor</u>

Total waste generation can be projected into the future using population growth projections applied to current waste generation. Material types can be estimated by multiplying current percentages of the waste stream by projected overall waste generation. Upper and lower bound estimates would be based on the standard deviation of the underlying population statistics employed. (For example, population growth rates might be 2% overall, plus or minus 0.5%.) We will utilize future population growth rates that have been developed by the California Department of Finance.

<u>Method 2. Overall Waste Generation Trends as a Growth Factor</u>

Alternatively, we can develop an upper and lower bound by looking at the five-year history of per capita waste generation, and calculate a standard deviation from those data. In this case, we would be using the past variability of waste generation to predict the future variability of waste generation. In this case, we would continue the historical trend, extrapolating into the future. For instance if the historical growth rate has been 2% per year for several years, it might be reasonable to assume that that trend will continue, and that future growth will also be 2% per year.

<u>Method 3. Material-Specific Generation Trends as a Growth Factor</u>

As another alternative, we could look more specifically at the generation history of individual material types, especially plastics, paper and organics, and extrapolate into the future. For plastics in particular, the growth rate of plastics in the waste stream is much larger than the growth rate of the overall waste stream or population. We may find that the other material types also follow their own independent patterns, and we may be able to both project both growth rates and standard deviations that would help us estimate upper and lower bounds, on a material-specific basis. This material-specific method is preferable in terms of accuracy, but may be the most difficult in terms of data availability. In the cases where material-specific data is available, we will use historical growth rates to predict future growth, using straight-line growth assumptions.

It is likely that material-specific data will be very good for one type of material, but not available or specific enough for the other material types. If that is the case, we will use this third, more accurate method for some material types, and one of the other two methods for the remainders. In the event we use a combination of approaches, we will have to make some corrections to totals to make sure that 100% of the materials are accounted for.

In recent years, recycling markets for the major paper and plastics categories in California have experienced an abundance of demand. Even as supply of recyclables has grown through the implementation of new recycling collection programs, processors and exporters of materials continue to state that materials are difficult to obtain, and that the quality of materials has declined in recent years (i.e., contamination rates are higher than in the past.) As we begin this study, our assumption is that markets will be able to accept even greater quantities of materials that will be collected for recycling in the future.

3.2 Facility Location Assumptions

CIWMB staff crafted three assumptions regarding the location of these potential conversion technology facilities. The first assumption, described in the facility configuration scenarios, is that the first facilities to be developed would be developed in the two major population centers in the state: the San Francisco Bay Area and the Greater Los Angeles Area. The second assumption is that facilities would be co-located at landfills or Materials Recovery Facilities, and the third assumption is that these facilities would be geographically dispersed throughout each of the two regions under study. As a result, differences in transportation costs to either recycling or CT facilities are assumed to be insignificant to the study findings.

3.3 Description of the Two Regions

The two regions are defined by county borders. The San Francisco Bay Area is defined for the purposes of this study as a nine county area. It includes the counties of Alameda, Contra Costa, Marin, Napa, San Mateo, Santa Clara, Solano, Sonoma, and the City and County of San Francisco. The Greater Los Angeles Area is defined for this study as the counties of Los Angeles, Orange, Riverside and San Bernardino. The San Francisco Bay Area has a total of 82 jurisdictions within the nine-county area. The Greater Los Angeles Area has a total of 171 jurisdictions within the four-region area.

Information about the waste *originating* within these counties will be used in this study. A recent CIWMB study found that 97% of materials are disposed of in the same region in which they are generated, confirming that only small amounts of disposal tonnages are transported from one region to another.

3.4 Define Feedstock Material Types and Sources

The definitions of feedstock material types are dependent on the conversion technologies themselves. Some of the technologies under discussion can tolerate a wide variety of composition in feedstock. Other technologies can only tolerate a narrow range of materials. As this study progresses, more complete feedstock definitions will be forthcoming from the National Renewable Energy Laboratory (another subcontractor on this project) and the University of California at Riverside (which is doing work under a separate contract for CIWMB to characterize conversion technologies, including feedstock and operating costs).

The model will be designed with flexibility to change the feedstock composition and sources when more information becomes available. At this time, potential feedstocks include: plastics, paper, green waste, MRF residuals, mixed paper, and mixed waste, such as the kind of waste that currently goes to landfills. We will describe and quantify each type of feedstock, and will explain the conditions that are necessary to make the material marketable to recycling processors or CT facilities.

3.5 Definition of Costs of Conversion Facilities

Conversion technologies will be defined in terms of the tipping fee they will charge to accept feedstock, as well as the tipping fees they will charge for each type of feedstock, if they can use more than one type of feedstock. The University of California at Riverside (UCR) is conducting research into the various vendors of conversion technologies and the financial requirements of each system. UCR will provide tipping fees for conversion facilities, which will be inputs to the overall financial model.

4.0 DATA SOURCES

Most of the data that will be used in this study will come from existing, published sources. High-quality disposal data, diversion data, market price data, etc. are readily available from CIWMB reports and databases, industry sources, and trade publications. At the same time, since this study is the first of its kind to examine the potential impacts of conversion technologies on existing and future recycling and composting markets, some new data will have to be developed through surveys, interviews, original research and estimates.

While there are several published reports that will be excellent sources of data for this study, two reports in particular warrant summarizing here because of their similarity and applicability. The "Economic Impacts of Waste Disposal and Diversion in California" was prepared by the University of California at Berkeley in April, 2001, using data for the year 1999. The "U.S. Recycling Economic Information Study" was prepared by R.W. Beck in July 2001, using data from 1997. A California version of the national study was dated June 2001. While the methods differed between the two studies, they both estimated:

- Total number of businesses and jobs related to recycling and other diversion activities in California.
- Total revenues related to recycling and composting and estimated the jobs created per thousand tons diverted.
- Economic impact by material type (i.e., paper, plastics, etc.)
- The Berkeley study also estimated impacts on a region-by-region basis.

Document Name or Source Group	Specific Data That May be Used in this CT Study
Employment & Revenue Factors	
The Economic Impact of Waste Disposal and Diversion in California – April 2001 *California Integrated Waste Management Board (CIWMB) (prepared by UC Berkeley)*	Economic information, data sources, employment conversion factors
US Recycling Economic Information Study – July 2001 *National Recycling Coalition (prepared by R.W. Beck)*	Economic information, data sources, employment conversion factors
Population Projections	
California Department of Finance, Southern California Association of Governments (SCAG), Association of Bay Area Governments (ABAG), California State Universities	Population forecasts for the State, jurisdictions, and regions
Plastics Recycling Quantities	
2001 Report on Post Consumer PET Container Recycling Activity *National Association for PET Container Resources (NAPCOR)*	Plastics recycling quantities, recycling rates
Recycling Rates for Rigid Plastic Containers *California Integrated Waste Management Board (CIWMB)*	Plastics recycling quantities, recycling rates

Document Name or Source Group	Specific Data That May be Used in this CT Study
2001 All-Container Recycling Rate – Sept 2002 *California Integrated Waste Management Board (CIWMB)*	Plastics recycling quantities, recycling rates
2000 National Post Consumer Plastics Recycling Report *American Plastics Council*	Plastics recycling quantities, recycling rates
Draft Plastics White Paper: Optimizing Plastics Use, Recycling, and Disposal in California, May 2003, prepared by the NewPoint Group Management Consultants for the California Integrated Waste Management Board	Plastics recycling rates, recycling and generation trends, market issues
Several publications, including Waste News, publish market prices for plastics for different market areas, such as Los Angeles	Market prices and history of prices
California Department of Conservation, Division of Recycling	Plastics quantities recycled and market prices
Paper Recycling Quantities	
Annual Statistical Summary of Recovered Paper Utilization *American Forest & Paper Association*	Paper recycling quantities, recycling rates
Organics Recycling Quantities	
Assessment of California's Compost- and Mulch-Producing Infrastructure – June 2001 *California Integrated Waste Management Board (CIWMB)*	Organics diversion quantities, diversion rates, by region, by end-use type The data was gathered in 2001 by a survey of operators with a 93% response rate. The survey is currently being repeated, and more information is being sought this year, including economic information.
Diversion Rates & Statistics	
Countywide Diversion Progress Reports *California Integrated Waste Management Board (CIWMB)*	List of diversion rates for jurisdictions and regional agencies within the counties under study
Jurisdiction Planning Annual Report Information System (PARIS) Reports *California Integrated Waste Management Board (CIWMB)*	Diversion programs and tons diverted for selected programs for all jurisdictions

Document Name or Source Group	Specific Data That May be Used in this CT Study
CIWMB SWIS List (for Material Recovery Facilities) *California Integrated Waste Management Board (CIWMB), on web site*	For list of all Material Recovery Facilities in each region
Local Enforcement Agencies	Tonnage data at each facility. For MRFs, both incoming and outgoing tonnages are tracked. Can calculate number of facilities at 30% threshold.
5-Year Reviews of Countywide Integrated Waste Management Plans *(from individual counties)*	Permitted capacities of landfills, expected closure dates

5.0 COMPONENTS OF FINANCIAL MODEL

The proposed Market Impact Assessment model is anticipated to consist of integrated modules, each of which is a building block for the overall analysis of the three market condition scenarios. Preliminary contents of these modules are described below and may be refined based on interaction and comment from RTI, CIWMB, focus group participants and peer reviewers.

5.1 Module 1: Scenario Definitions and General Assumptions

This module will be a placeholder for the key assumptions of the model, such as daily capacity of each type of conversion technology facility. In order to perform sensitivity analyses, changes to the assumptions will be made within this module, and will automatically feed to other modules. This mechanism is used to reduce the potential of data entry errors and to make key assumptions transparent to the reader.

In addition, keeping the key assumptions together in one location is a structural strategy that keeps the model flexible enough to accommodate likely changes and aids in conducting a sensitivity analysis.

MODULE 1 – SUMMARY OF INPUTS TO MODEL

- **Scenario Definitions**
  - Tons per day of each CT process, by year (2003-2010)
  - Feedstocks to each CT process
- **Tipping Fees for Each CT Process**
- **Standard Growth Factors**
  - Regional population growth rate projections
  - Inflation-based factors
  - Materials growth rates
- **Model Run Number and Key Parameters for that Model Run**
  - Market conditions
  - Growth scenarios
- **Market Conditions**
- **Landfill Closure Dates**

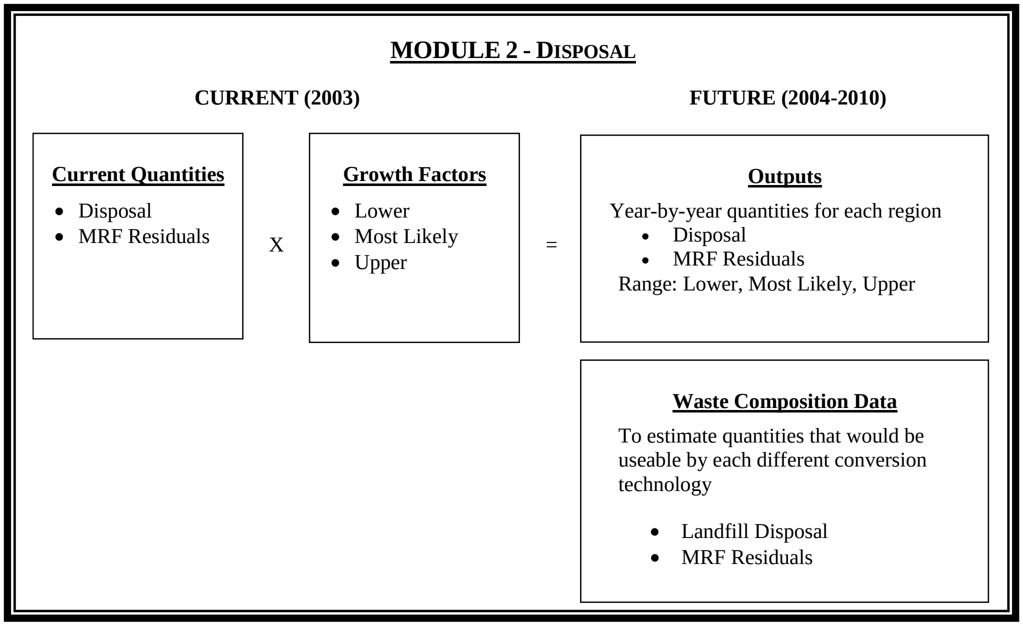
5.2 Module 2: Waste Disposal Quantity

The goal of this module is to create a baseline scenario (for the years 2003 to 2010) that allows us to estimate current disposal tonnage in total, current disposal tonnage of MRF residuals, current disposal tonnage of potential targeted recyclables, and future disposal tonnage before the effects of CT facility implementation or new programs that might increase diversion.

Waste disposal quantities are currently tracked by the CIWMB for every jurisdiction in the state, and yearly totals are available for each jurisdiction. The tracking system is called the Disposal Reporting System. By adding up the annual totals for each jurisdiction within the region, we can obtain the two regional disposal totals for 2002. We will then project disposal totals for each year, 2003 to 2010, by using population percentage growth factors developed by third party sources. (Potential third party sources for population projections are listed in the data sources section.) The output of this module will be total disposal (in tons) for each year (2003 to 2010) for each material subcategory (e.g., plastics, paper, organics, and MRF residuals) for each of the two regions.

Data on MRF residuals is not available from the Disposal Reporting System. For MRF residuals, we will gather primary data from Local Enforcement Agency records for each MRF in each of the two study regions.

We will also calculate the amount of paper, plastics and green waste disposed in each region, by using waste composition percentages available from the CIWMB's 1999 Waste Characterization Study.



5.3 Module 3: Waste Diversion Quantity

Module 3: Waste Diversion Quantity is the companion to Module 2: Waste Disposal Quantity. The goal of this module is to create a baseline scenario (for the years 2003 to 2010) that allows us to estimate current diversion tonnage, and project future diversion tonnage before the effects of CT facility implementation or new programs that might increase diversion. Projections of future quantities (2004 to 2010) will be made using the growth scenarios described in section 3.1.

For the purposes of this study, we are only interested in the total amounts of paper, plastics and green waste diverted, including green waste that is used as Alternative Daily Cover. We will not quantify other diverted materials, such as metals or construction and demolition debris. The Disposal Reporting System will be a primary data source for Alternative Daily Cover (ADC) quantities. The use of green waste as ADC has been a significant factor affecting the composting markets in the state, and as certain landfills close in the years 2004 to 2010, more green waste will be available to either the compost market or elsewhere. We will estimate these potential effects in module 3.

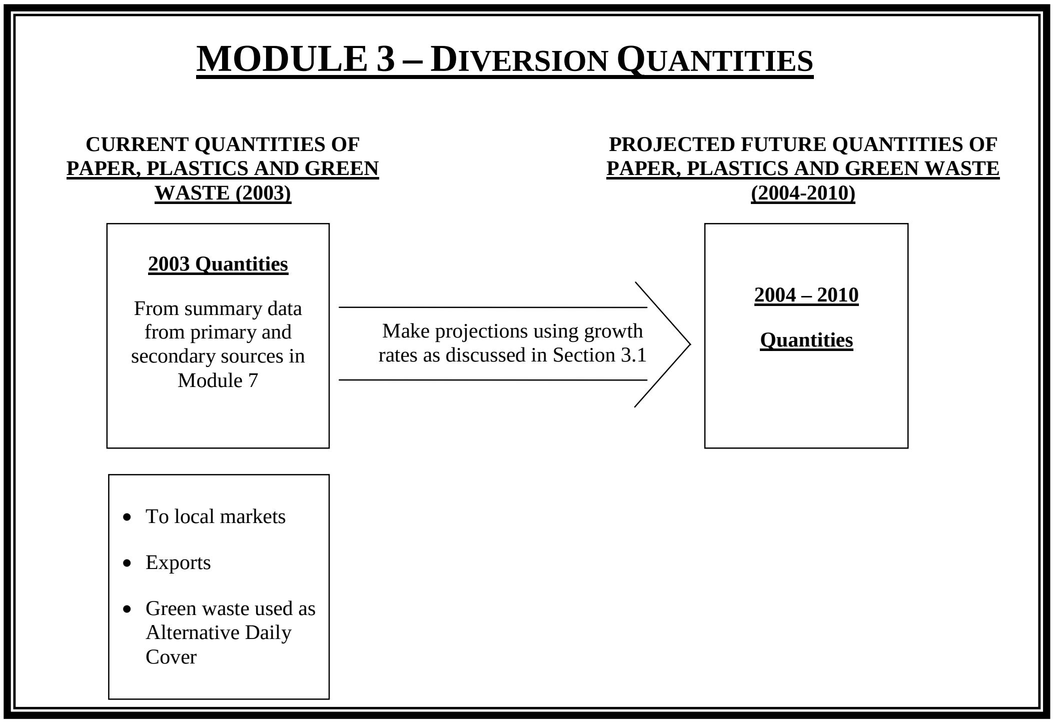
Unlike disposal, there is no statewide tracking system for diversion tonnage. There are many sources of information for diversion tonnages, but the sources vary greatly in terms of the information they track. The jurisdictions themselves track diversion quantities, but the jurisdictions usually do not track data by material type (plastic, paper, etc.) Industry associations track recyclables by material type, but regions are much more broadly defined, and often statistics are only reported on a nationwide level. There is no single source that has all of the diversion data that is needed for this study, for the exact regions under study.

The most accurate, region-specific, material-specific data is held by the recyclers and exporters themselves, and there are a limited number of recycling companies and exporters that handle the vast majority of paper and plastics that are recovered in California. We therefore plan to conduct a survey of these companies to estimate the quantity and material types of paper and plastics recovered annually in the two regions. In addition, since much of the paper and plastics are exported through California ports, we plan to request export data for the relevant ports (Los Angeles, Long Beach, Oakland, etc.) It remains to be seen whether the ports or the private exporting companies will be the best source of data. The survey of recyclers and exporters will also gather information for modules 6 and 7 and qualitative information regarding market trends. The types of businesses to include in this study are listed in section 5.7. The data collection form, survey recipient list, and survey procedures will be submitted to CIWMB for approval before beginning the survey.

Similarly, in 2001, the CIWMB conducted a study of the green waste markets in California. The "Assessment of California's Compost- and Mulch-Producing Infrastructure" included a survey of every green waste processor in the state. Ninety-three percent of the operating facilities responded to the survey, and provided very good estimates of the total amount of materials processed. The state was divided into five regions, and data were published on a regional level. The study is being repeated for 2003; data collection is currently underway. If data from the new survey is available, we will be interested in using the 2003 region-specific data, including the following categories of data:

- Types of feedstock accepted by facilities, in tons per year
- Total quantity of feedstock accepted per year
- Processing capacity, in tons per year
- The major sources of feedstock, including municipal collection, private contracted collection, MRF-generated, and self-haul
- Changes in processing capacity in the last year
- Issues related to increases in air quality permit requirements in the greater Los Angeles area, under the South Coast Air Quality Management District's Rule 1133
- Competitive issues related to the use of green waste for Alternative Daily Cover (ADC)

All of the data sources listed above will be used to estimate the total size of the market in the two regions, both in terms of tons handled and total revenues. We will also be able to see the market trend from 2001 to 2003 in each region, and will use the number of firms in the region, along with total materials handled, to compute per-firm averages.



5.4 Module 4: Jurisdiction Diversion Gap

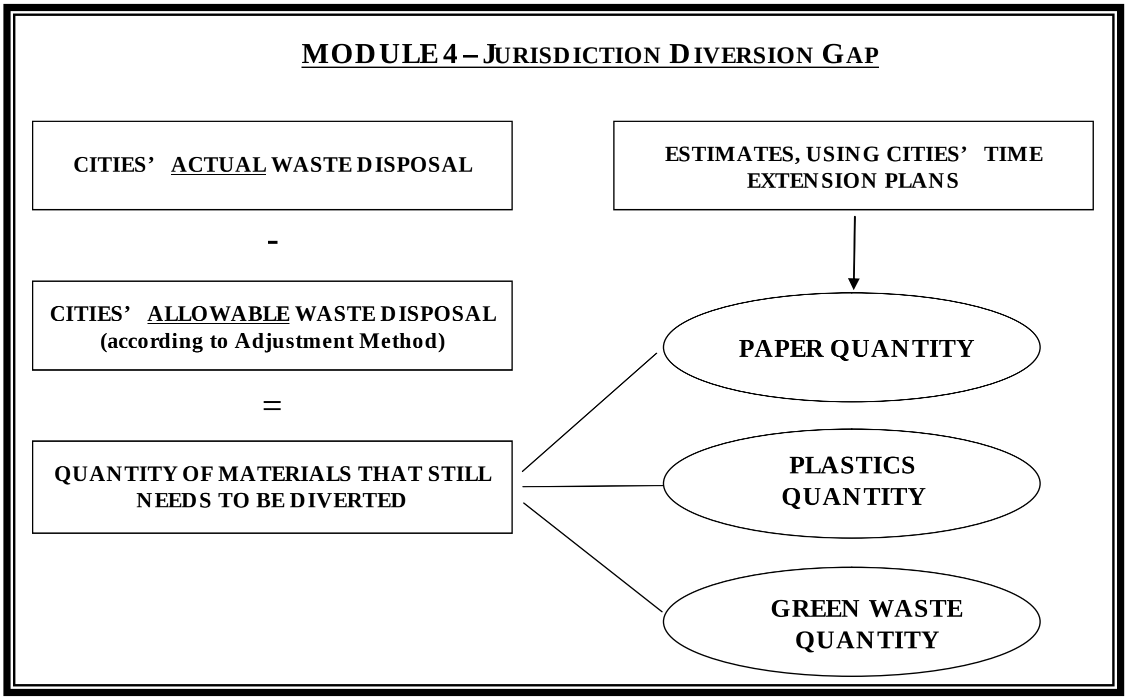
Many jurisdictions in California have yet to fully comply with the diversion rate goals of AB 939. Forty-four of the 82 jurisdictions in the San Francisco Bay Area region had not yet reached 50% diversion by 2001, the most recent year for which diversion results are available. One hundred five of 171 jurisdictions in the Greater Los Angeles Area had not reached 50% by 2001.

Some of these jurisdictions with less than 50% diversion rates will be able to show compliance with AB 939 through a “Good Faith Effort” finding by the Board, but the majority of these jurisdictions have already asked for, and received, a time extension. Some others are under “compliance orders” from the CIWMB, and must implement new programs to divert additional materials or face penalties.

The time extension application prepared by a jurisdiction explains which programs they will implement in order to increase their diversion rate to 50%, and estimates a tonnage recovery amount for each program. These time extension applications will be the primary source of data for Module 4. We will extract program data and tonnage estimates from the time extension applications. In the cases where the data is not material-specific, we will have to estimate the quantities of new plastics, paper and green waste the jurisdictions are pledging to recover, using average recovery rates (from programs implemented in other jurisdictions) for the types of programs specified. Lower bound, most likely, and upper bound growth rates will be estimated using the same growth factors methods specified in section 3.1.

The totals from module 4 will be the quantities of additional materials that will be recovered as a result of jurisdictional efforts to increase diversion in order to comply with AB

939. Module 4 therefore modifies Modules 2 and 3, and establishes a new baseline. Module 4 estimates how current levels of diversion will change due to the regulatory pressure of AB 939, and the number of additional tons of plastic, paper and green waste might be recovered as a result.



5.5 Modules 5: Disposal Costs

The goal for this module is to estimate costs of disposal so that costs can be later compared to the costs of various CT facilities. The CIWMB has a database of facilities and nominal tipping fees at landfills and transfer stations, which would need to be updated for this study for facilities located in the two regions. There are three tiers of disposal costs: 1) the posted gate rate, which is generally paid by customers that have lower volumes; 2) contract rates, which are paid by customers with larger volumes who have entered into contracts with facilities to deliver a certain quantity of waste, and 3) internal transfer prices for companies that own their own landfills (internal transfer prices are paid by the collection division of a company to that company's landfill division). If we simply use posted tipping fees ("gate rates"), we will be overstating the disposal prices that most customers pay, and misstating the comparative prices between disposal and conversion technologies.

We will therefore seek to estimate actual disposal prices that all customers pay. Many of the landfills in the two study regions are publicly-owned and operated, and so the prices paid and names of customers are a matter of public record. For example, the actual tipping fees are known (through public records) for more than two-thirds of the waste disposal in the Los Angeles area. These public rates can be verified through telephone surveys, web searches for posted rates, examination of publicly available contracts, etc. Some waste customers are municipal haulers, and their collection arrangements can be obtained through interviews and records requests. Actual disposal costs (tipping fees) will be entered into the financial model, using a combination of mostly publicly available records, and in some cases, information from internal files on tipping fees proposed to jurisdictions during the procurement process. Assumptions will have to be made in order to estimate the disposal prices paid when those prices can not be directly obtained through records. In the absence of other information, the most likely assumption will be that the actual tipping fee paid is the non-discounted, posted "gate rate."

With this information, we can calculate the current average per ton disposal cost. More importantly, we can construct a table that shows the number of tons that are currently disposed in each study area at a range of different price points. The figure below is an example of how this information will be summarized; the numbers in the table are completely fictitious, and are only used for illustration purposes.

DISPOSAL PRICE SUMMARY EXAMPLE

Landfill Tipping Fee Paid	Number of Tons per Year	Percent of Total
Under $20 per ton	2,000,000	20%
$20 - 30 per ton	6,000,000	60%
$30 - 40 per ton	1,000,000	10%
$40 - 50 per ton	500,000	5%
$50 - 60 per ton	500,000	5%
	10,000,000	100%

For the years 2004 through 2010, we must forecast disposal costs. In some cases, there are county-wide long-term contracts which either specify fixed prices, or contain inflation-based escalators. In the Greater Los Angeles Region, for example, all of the Orange County landfills are governed by long-term contracts with their customers that specify prices beyond 2010. Similarly, all of the San Bernardino County landfills are governed by a long-term contract. However, disposal facility closures and/or permit non-renewals may occur in the time frame specified (2003 to 2010), and may greatly affect the marketplace, increasing distances to landfills, making transfer stations more attractive and driving up landfill prices overall. We plan to research the permit expiration dates and daily capacities of key facilities (those which may close before 2010) in order to calculate the overall loss of capacity to the system. Significant facility closures are likely in Los Angeles County during this decade, and we expect that prices there will rise.

MODULE 5 – DISPOSAL COSTS

CURRENT				FUTURE
2003 Disposal Costs	X	**Cost Increase Factors** 1. Information on public contracts that allow for fixed prices or specified formulas for price increases and other market volatility factors 2. Inflation-based increases, such as Producer Price Index	=	**2004 – 2010** **Disposal Costs**

5.6 Module 6: Diversion Revenues and Prices

After recyclables (paper and plastics, in this case) are sorted at a material recovery facility or at a paper stock dealer, they are typically baled and shipped to market – either to an export market for transport overseas, or to a local processor, which converts the material into a useful product. The material recovery facility incurs costs to sort and transport the material, but receives revenues from the sale of the materials. Revenues are per pound or per ton, and depend on the type and quality (i.e., level of contamination) of material delivered. Deductions are made from full prices for materials that have contamination levels in excess of the agreed-upon level.

Historical market price data is readily available; market prices are published weekly in a variety of industry publications, including Waste News, and paper and plastics trade magazines. For context, we will report both the ten-year market price history (if available) as well as inflation-adjusted market prices. We can estimate overall revenues by multiplying tons sold by the price per ton.

For purposes of projecting prices into the future, we will research 10-year trends and averages, to project market prices for recovered materials into the future. Market prices for recyclables have always been volatile. We will reflect this volatility by describing prices as a range of values. The center point of the range will be the most likely price. The lower price in the range will be the lower bound, and the higher price in the range will be the upper bound, both of which will be calculated based on the historical volatility of market prices.

Industry experts will also be interviewed regarding pricing trends. Note that industry experts are reluctant to discuss specific future prices, for fear of violating anti-trust laws, so proper care must be taken during the survey or interview process.

MODULE 6 – DIVERSION REVENUE AND PRICES

Commodity prices, as delivered from MRFs to processors and export markets	X	**Existing and future tons processed (from Module 3)**	=	**Estimated total revenues (existing and future)**

5.7 Module 7: Current and Future State of Recycling Businesses

Module 7 is very closely related to modules 3 and 6, and the data-gathering for the three modules will occur simultaneously. The goal of this module is to estimate the number of recycling businesses for each material type that serve the two regions, including number of establishments, existing number of jobs in total, and annual revenues. Annual tons of materials handled or processed is included in module 3, and pricing and revenue information is included in module 6. This module will also project growth trends for recycling businesses, based on the number of tons projected in module 3 and the prices projected in module 6. The tonnage growth factors in module 3 and price increase factors from module 6 will be used to estimate the overall future state of recycling businesses in module 7. (Module 7 won't introduce any independent growth or price increase factors, as those will have been defined in modules 3 and 6.)

The first step in the process of this module is to define the businesses that we will be studying. The table below lists definitions that were developed for the U.S. Recycling Economic Information Study, which was prepared by R.W. Beck, Inc. for the National Recycling Coalition.

BUSINESS CATEGORY DEFINITIONS

Excerpted from: U.S. Recycling Economic Information Study, prepared by R.W. Beck, Inc.

Business Category	Definition	Include in Market Impact Assessment?
1. Government Staffed Residential Curbside Collection	Recyclables collection using government employees	Include green waste and paper/cardboard collection
2. Private Staffed Residential Curbside Collection	Private sector collection of recyclables, including contract collection on behalf of municipalities	Include green waste and paper/cardboard collection
3. Compost and Miscellaneous Organics Producers	Produce compost, mulch, bark, or bedding from yard and wood waste, biosolids, or other organics, also includes vermiculture	Yes
4. Materials Recovery Facilities	Process commingled or recovered materials, usually from curbside/drop-off collection or recyclables separated from solid waste	Yes

Business Category	Definition	Include in Market Impact Assessment?
5. Recyclable Material Wholesalers	Paper stock dealers, scrap metal processors, and other establishments that sort, remove contaminants, and densify recovered materials and brokers of recovered materials	Yes, but limit to paper, plastic, organic material wholesalers, if possible
6. Paper, Paperboard, and Deinked Market Pulp Mills	Produce paper and paperboard products from recovered paper or market pulp and/or deink recovered paper and sell pulp	Yes
7. Paper-Based Product Manufacturers	Produce cellulose-based products from recovered paper or paperboard (e.g., cellulose insulation, hydro-seeding, animal bedding)	Yes
8. Plastics Reclaimers	Transform recovered plastics directly into products (e.g., plastic lumber) or raw materials ready for remanufacture	Yes
9. Plastics Converters	Convert a recycled plastic clean flake or pellet into an intermediate or end product	Yes

Separate strategies must be employed in order to obtain data for each business category. In some cases, we have access to region-specific, material-specific data of high quality. Such is the case with item #3 in the table above. Region-specific green waste composting data was developed in the 2001 CIWMB study, "Assessment of California's Compost- and Mulch-Producing Infrastructure," and is currently being updated and expanded in the 2003 version of the study.

Similarly, we have in-house databases for items 1 and 2 in the table, government and private residential curbside collection. However, we will need to disaggregate the data, because residents are generally charged one all-inclusive fee for three curbside services (refuse, recyclables and green waste collection.)

For Materials Recovery Facilities (MRFs), we can easily obtain tonnage records from Local Enforcement Agencies, and then use tipping fee information to estimate revenues. We can use a combination of labor rates, interviews and surveys to estimate employment.

The CIWMB produces annual estimates of the recycling rate for rigid plastic packaging containers, and tonnage data for certain other plastics are available through the CIWMB. For categories 5 through 9, we will first contact industry associations to determine if they will release data from their annual surveys. The American Forest and Paper Association (AF&PA), and the American Plastics Council (APC) conduct annual surveys to determine the overall recycling rate for the material types they represent. Since our regions are relatively small, geographically speaking, we anticipate that it will be difficult for these associations to release certain information, for fear of releasing confidential information about a single firm. For example, there is only one newsprint deinking facility in the State of California, so any release of information relating to that category would be the same as releasing that one company's confidential business information.

In those cases where we are unable to obtain region-specific information, we will instead use statewide information, and will disaggregate it to the regional level. Disaggregation will be proportional to the region's share of the state, using either a population percentage, or a waste disposal percentage.

<u>MODULE 7 – STATE OF RECYCLING BUSINESSES</u>

Module 7 will be a database of recycling businesses that process materials, including the various business categories identified in Section 5.7. Business names will be kept confidential, and will only be described in aggregate. Primary data will come from surveys and interviews of recycling businesses and review of publicly available data.

<u>Interviewees (summary list)</u>	**<u>Consolidated Data from Interviews</u>**	**<u>Calculated from Consolidated Data</u>**
• MRFs • Plastics/Paper Processors • Plastics/Paper Brokers (see section 5.7 for more detailed list) Green waste data from CIWMB study (see section 5.3)	• Total tons processed by material type • Total number of jobs • Total revenues	• Average tons processed per employee • Average revenue per employee • Average revenue per business/firm • Average revenue per ton processed • Average number of employees per firm

5.8 Module 8: Conversion Technology Costs and Feedstock Requirements

One goal of this module is to pull in conversion technology cost estimates from the other studies on CT that are taking place concurrent to this study. Data sources may include cost data gathered during the Life Cycle Analysis or the technology assessment, and data from the proponents of the technologies themselves. We will not develop independent estimates of costs of technologies, but rather use the cost estimates developed by others. One of the uses of the cost information of this module is that, by knowing the price differential between CT and existing and future recycling and green waste markets, we will be able to estimate the magnitude of protective subsidies that might be employed under one of the hypothetical scenarios described in section 2.3, Market Conditions.

Another goal of this module is to summarize feedstock requirements. We do not yet know exactly what types of feedstocks are acceptable to the various types of technologies or what range of contamination is tolerated by each technology. We also do not yet know where the bulk of the feedstocks will originate. We will use the feedstock information to estimate which materials and which markets might be affected by the development of CT facilities, considering material availability alone, and separately, price differentials between recycling markets and CT markets.

MODULE 8 – Conversion Technology Costs, Quantities and Feedstock Requirements (2003-2010)			
Technology	# of Tons Per Day in Each Region	Facility Tipping Fees	Acceptable Feedstock Definition
Conversion Technology #1			
Conversion Technology #2			
Conversion Technology #3			

5.9 Module 9: Summary/Integration Module

The goal of this module is to summarize the quantity of materials affected, and compare relative costs for disposal, recycling, and conversion technologies. This module will integrate data from the other modules, and will present the data side-by-side so that it can easily be read and comparisons can be made. For instance, it would be ideal to see a given scenario on one page; for the selected region, market conditions, and growth scenario, the estimated tons to disposal, CT, recycling, composting facilities and export markets will be shown, along with the accompanying number of employees, annual revenues, and market prices that are predicted for that scenario. The entire financial model, including this module, will be used to store and analyze *quantitative* information. To interpret this data, we will also use *qualitative* data, which is described in the following pages.

MODULE 9 – SUMMARY AND INTEGRATION MODULE

Summary of Disposal and Diversion Quantities
- Existing and projected waste disposal, 2003-2010
- Existing and projected waste diversion, 2003-2010

For the Following 3 Cases
1. Base Case
2. Base Case Plus AB939 Implementation
3. Base Case Plus AB939 Implementation and Conversion Technologies

Summary of MRF Quantities
- Existing MRF sorting capacity and current utilization
- Quantity of MRF sorting capacity that would be needed for full CT development as envisioned by model
- Quantity of excess or deficit

Summary of Price-Based Decision-Making
- Existing and projected waste disposal, 2003-2010
- Existing and projected waste diversion, 2003-2010

Summary of Recycling and Composting Businesses (for each of 3 cases)
- Number of firms, by business type
- Total number of employees
- Total annual revenues
- Tons processed

6.0 BENCHMARKS/MEASUREMENT TOOLS

This section describes how we will use the data gathered in the financial model to answer the key questions that are at the heart of the study.

6.1 Questions Regarding Production, Economic and Financial Impacts on Recycling and Composting Industries

6.1.1 What impacts might the development of conversion technologies, under the varying market conditions, have on recycling and composting industrial growth and expansion? How will the varying market conditions and constraints affect existing recycling and composting businesses' ability to stay in business and to site new facilities in the 2005 to 2010 timeframe?

Based on the projected feedstock requirements for the conversion facilities estimated in our model for the specified conversion facility configurations, we will compare the projected amount of recycling and composting activity (in tons/year) with and without conversion technologies. We will calculate the estimated loss of business activity in tons and express this as a percentage loss compared to total existing and projected recycling and composting operations. We will also estimate the revenue loss to these businesses based on average prices per ton multiplied by the number of tons diverted to feedstock for conversion technologies. If the feedstock is primarily MRF residuals that are being landfilled, then the impact on the recycling and composting facilities will be limited; instead, the impact will be on landfills. The development of CT may also impact MRFs, causing more sorting of materials to occur in MRFs. The analysis will be repeated for each growth scenario, market condition, and conversion technology configuration analyzed, resulting in an analytical matrix that summarizes a range of potential outcomes.

6.1.2 What impact will likely changes in the global economy (e.g., availability of containers for shipping collected materials) have on export markets for secondary paper and plastic from California, and how will such changes in export markets impact conversion technologies?

The fact that so many shipping containers are returning to Asia from West Coast ports *empty* has driven down freight prices to Asia over the last several years, and has made it far more attractive to ship recyclable materials that distance. Labor rates are also much lower, in China in particular, and there is a great demand for recyclable paper and plastic. According to industry experts, the combination of these factors has driven market prices for paper and plastics higher, and quality lower (as measured by contamination levels).

We will continue to survey and interview industry experts for this study in order to learn how much higher they expect market prices to rise, and how much longer the demand for recyclables will grow in China. Data on the available, unused capacity of recycled paper and plastics manufacturing facilities will help us estimate whether future supplies of materials can be accommodated by the local markets. Our initial assumption is that a glut of materials is not foreseeable in the next few years, but we will seek opinions from industry experts to verify that assumption, and to expand on what conditions would be needed to produce a glut in materials. Estimates of future market prices, and acceptable quality levels, for recyclables will be compared to prices and feedstock requirements for CT facilities, in order to determine how the two markets will affect each other.

6.1.3 What impact will the development of conversion technologies have on recycling and composting feedstock availability, price, quality, and volume in the near term (e.g., 2003 to 2005) and in the years 2005 to 2010? Would recycling and composting businesses be able to expand production and increase sales, revenue, profit, and employment in the 2005 to 2010 timeframe?

To answer this question, we will first need more definitive information on feedstock descriptions and quality requirements for the CT facilities. We do not yet know if CT facilities will compete directly for the same materials as existing recycling and composting facilities. We also do not know if CT facilities would offer attractive prices for lower quality materials than the recycling and composting industries. Where the model predicts a gain or loss of materials to recycling and composting industries, we will calculate the tons that would be gained or lost from by typical firms in the recycling and composting industries (through the model) and will explain:

- What percentage of the market that tonnage represents;
- The dollar value of the gained or lost revenue, that would be calculated as tons multiplied by price per ton;

- The number of businesses in the area that might be impacted by the gain or loss of that material type;
- The amount of profit increase or reduction, based on tonnage loss and average profit margins; and,
- The number of jobs gained or lost, based on tonnage and the calculated average number of jobs per thousand tons.

6.1.4 What impact will the development of conversion technologies have on recycling and composting businesses' ability to site new facilities? Will new opportunities exist for recycling and composting businesses to be created or expanded? Will facilities shut down? How many facilities might close due to such development in 2005 to 2010?

This question may or may not be relevant, depending on the answer to the previous question. If there is no erosion of the business volume in recycling and composting industries due to development of CT facilities, then this question does not apply. If there is feedstock reduction in the recycling and composting industries, this question asks how severe that reduction will be. In order to answer it, we will have to ask (through surveys and interviews) industry experts what percentage of capacity must be maintained in order to keep a plant from shutting down. Some plants must keep operating 24 hours a day in order to remain economically viable, while others have less stringent requirements. We will include information in the written report about particularly vulnerable business types or business conditions that would help explain which businesses might close due to increased competition for materials.

6.1.5 What conversion technology facility configuration would have the greatest impact on recycling and composting? What configuration would have the least impact on recycling and composting? What modeling assumptions, when changed, cause the greatest change in impacts and/or projections?

All of these questions will be answered once the model is complete, and we perform sensitivity analyses, changing one model parameter at a time, to observe its results on the overall model.

6.2 Questions Regarding Institutional Impacts on Recycling and Composting Businesses

6.2.1 What is the history of county and city secondary paper, plastic and green waste contracts awarded?

Based on information we have previously obtained from more than 200 cities and counties throughout northern and southern California regarding their contractual solid waste service arrangements, we will summarize the most common methods used by public agencies to recycle or dispose of their paper, plastic, and green waste. Generally, most cities that contract for private collection service allow their waste hauler(s) to independently determine the arrangements for disposition of recyclables and green waste, and the contractual relationship is usually between the waste hauler and the processing facility. Processors may have their own contracts with commodity brokers. Cities with publicly provided collection service make their own arrangements for disposition of materials to a MRF or composter (or in some instances, green waste is delivered to a landfill for use as alternative daily cover). We will summarize the parameters of the contractual arrangements, such as typical parties to the agreement, contract terms and pricing arrangements. The final report will also include a discussion of how MRFs might affect and be affected by CTs, and the extent of the role they play in recycling and composting markets.

6.2.2 What impacts would the development of conversion technologies facilities in the region have on these existing relationships and why?

We will interview key entities responsible for contracting for the disposition of paper, plastic, and green waste, such as waste haulers with significant operations in either northern or southern California, and MRF operators that process significant quantities of material, to determine the potential impacts that the development of conversion facilities might have on their decisions regarding the disposition of the designated materials. We will also ask them how they feel CT commercialization might expand the potential range of MRF materials markets.

6.2.3 What factors might influence local government decisions to transfer secondary materials from recycling and composting businesses to conversion technology facilities or vice versa?

We will interview managers responsible for solid waste service arrangements at public agencies to determine whether or how these decision-makers might influence the destination of materials. We are familiar with the typical contracts used between public agencies and their solid waste service providers because we have negotiated them on behalf of more than 50 public agencies in California, and we have reviewed the terms of dozens more. As a result, we are familiar of the types of control that these contracts do or do not provide for the cities/counties to direct the flow of materials. Some of the potential benefits to a city (jurisdiction) that can affect decision-making include facility pricing, host fees, jobs created and tax revenues.

6.2.4 What might influence a hauler to switch from providing collected materials to recycling and composting businesses to, instead, conversion technology facilities? What might influence a hauler to switch from taking material to a landfill to a MRF or CT?

Based on interviews with managers from the waste hauling industry, we will describe the conditions and motivations that would result in redirection of waste quantities from recycling and composting facilities to conversion facilities.

6.2.5 What impacts will the development of conversion technologies have on the regional recycling infrastructure (hauling and processing of secondary materials)?

Based on the projected feedstock requirements for the conversion facilities estimated in our model for the specified conversion facility configurations, we will compare the projected amount of recycling and composting activity (in tons/year) with and without conversion technologies. We will calculate the estimated loss of business activity in tons and express this as a percentage loss compared to total existing and projected recycling and composting operations.

We will also estimate the revenue loss to these businesses based on average prices per ton multiplied by the number of tons diverted to feedstock for conversion technologies. If the feedstock is primarily MRF residuals that are being landfilled, then the impact on the recycling and composting facilities will be limited, and most impacts will be on landfills. In addition, focus group participants emphasized the potential increases in MRF sorting activity due to the potential implementation of conversion technologies. Since CT feedstock may need to be sorted to remove more materials than are currently removed from mixed wastes, perhaps more overall recycling will result. In other cases, materials separated for CT are completely different than materials separated for convention recycling and composting markets. We will explore these issues qualitatively, as well.

6.2.6 How would this vary under what growth scenarios, variations in market conditions, and conversion technology configurations?

The analysis performed in section 6.2.5 and section 5.9 (module 9) will be repeated for each growth scenario, market condition, and conversion technology configuration analyzed, resulting in an analytical matrix that summarizes a range of potential outcomes.

6.2.7 To what extent would put-or-pay contracts with conversion technology facilities affect recycling and composting businesses' ability to receive sufficient feedstock to maintain and/or expand their operations?

We will prepare a model run that assumes that the conversion technology facility configurations are fully utilized under put-or-pay contracts at maximum capacity in order to determine whether there is sufficient remaining feedstock for existing recycling/composting facilities to maintain or expand their existing operations. Specifically, we will calculate the reduction in feedstock available for recycling and composting facilities and determine its impact on their capacity utilization.

6.2.8 Will developers of recycling, composting, and material recovery facilities be more or less likely to site new facilities?

We will calculate the estimated demand for future recycling and composting capacity (in tons per year) with and without conversion technology facilities, and compare the estimated future demand to current demand to determine whether recycling/composting/MRFs will be able to site new facilities or expand existing facilities.

7.0 PROPOSED REPORT OUTLINE

I. Executive Summary
II. Background and Purpose
III. Approach
IV. Feedstock Descriptions for Conversion Technologies
    A. Acid Hydrolysis
    B. Gasification
    C. Catalytic Cracking

V. Waste Disposal and Waste Diversion Quantities
  A. Waste Disposal Quantities
  B. Waste Diversion Quantities
  C. Growth Factors
  D. Development of Projections of Waste Disposal and Waste Diversion Quantities

VI. Findings -- Characterize Impacts of Conversion Technologies
  A. Economic/Production Impacts
    1. Supply vs. Demand for Materials (feedstock availability, price, quality and volume)
    2. Recycling and Composting Industries' Growth and Expansion
      i. Sales
      ii. Profit
      iii. Employment
      iv. Infrastructure
    3. Export Market Impacts on California
  B. Institutional Impacts
    1. History of Secondary Paper, Plastics, and Green Waste Contractual Relationships
    2. Impacts of CT on Existing Contractual Relationships
    3. Key Factors/Influences Affecting Material Flow
      i. Local Government
      ii. Haulers

VII. Overall Conclusions
  A. Description of likely impacts and their magnitude
  B. Unlikely, but possible impacts
  C. Key variables that will play the biggest role in determining which impacts materialize

VII. Technical Appendix: Financial Model and/or Selected Model Outputs for Various Scenarios

VIII. Other Appendices, as needed

IX. Bibliography

Figure 1

GENERAL APPROACH

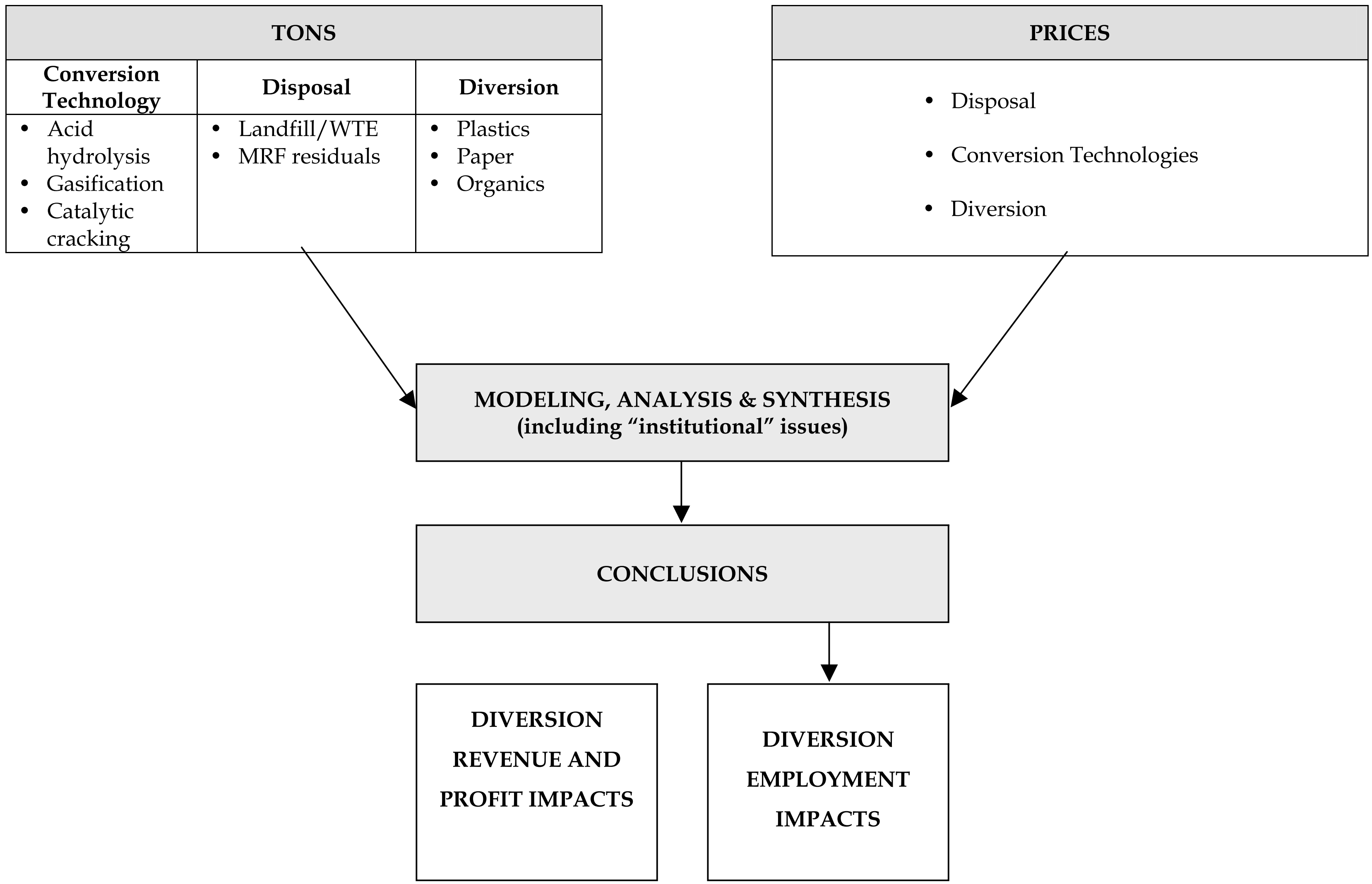


Figure 2

MODEL RUN SCENARIOS

Growth Scenarios (3)

1. Lower
2. Most likely
3. Upper

X

Market Conditions (3)

1. No protection
2. Protect current feedstock
3. Project future feedstock

=

Growth/Market Condition Model Runs (9)

9 variations of growth/ market conditions

→

Facility Scenario Model Runs

9 runs for each of 2 regions:

- Southern California
- San Francisco Bay Area

= 18 total Model Runs

Figure 3

FEEDSTOCK ANALYSIS

Feedstock Inputs	Projection Assumptions
• Generation (supply) - Plastics - Paper - Organics • Feedstock requirements (demand) - Existing Facilities - Conversion Facilities	• Growth scenario assumptions (percentages) • Market condition assumptions (flow)

Feedstock Outputs	2003	2005	2007	2010
• Excess (shortfall) in feedstock supply • Tons re-directed to conversion from recycling/composting facilities or from disposal facilities				

RECYCLING/COMPOSTING INDUSTRY IMPACT ANALYSIS

Recycling/Composting Industry Inputs

- Current recycling/composting revenues
- Current recycling/composting employment

Recycling/Composting Impacts

- Projected revenue impact to recycling/composting industries
- Projected employment impact to recycling/composting industries
- Projected profit impact to recycling/composting industries.